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ANNUAL REPORT -- FY 1985

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Cover--Ospreys are increasing in Montana. This is probably a result of the discontinued use of DDT and the recent formation of reservoirs. Photo by John J. Craighead.



During 10 years of predator studies on ranches in western Montana, common ravens increased dramatically. At the beginning, singles, pairs, and small flocks were seen scavenging kills made by coyotes and golden eagles. Now, flocks of 20-30 ravens are common around lambing herds, and raven predation on newborn lambs is becoming a serious problem. Photo by John J. Craighead.

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ANNUAL REPORT

of the

MONTANA COOPERATIVE WILDLIFE RESEARCH UNIT

University of Montana

Missoula, Montana

to

UNIVERSITY OF MONTANA

MONTANA FISH, WILDLIFE AND PARKS DEPARTMENT

WILDLIFE MANAGEMENT INSTITUTE

U.S. FISH AND WILDLIFE SERVICE, DEPARTMENT OF THE INTERIOR

Volume 2

October 1984-September 1985

Respectfully submitted,



Bart W. O'Gara, Leader



Joe Ball, Ass't. Leader

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MONTANA COOPERATIVE WILDLIFE

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Montana Fish, Wildlife and Parks Department
Wildlife Management Institute
U.S. Fish and Wildlife Service

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Border Grizzly Project
Bureau of Indian Affairs
Camp Fire Conservation Club
Cobb Foundation
Confederated Salish and Kootenai Tribes
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Double Four Corporation
Grizzly Bear Recovery Coordination Office
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National Wildlife Federation
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 National Bison Range
 Northern Prairie Wildlife Research Center
 Sheldon-Hart NWR
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 Nezperce, Payette, Salmon, and Targhee national forests
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U.S. National Park Service
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Wildlife-Wildlands Institute
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The following personnel joined the Unit on non-graduate student appointments of varying length:

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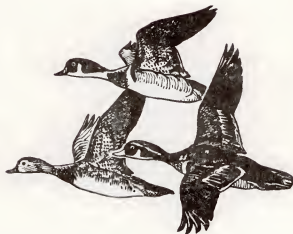
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(V-S) = Volunteer with subsistence allowance.
All others are paid positions.



ABSTRACT

Brainerd, Scott M., M.S., Summer 1985

Wildlife Biology

Reproductive ecology of bobcats and lynx in western Montana
(90 pp.)

Advisor: Dr. I. J. Ball

Reproductive ecology of the bobcat (Lynx rufus) and lynx (Lynx lynx) was studied in western Montana from 1982 through 1984. Home ranges averaged 111.4 km^2 for male bobcats and 61.5 km^2 for females. Adult lynx home range sizes averaged 122.0 km^2 for males and 43.1 km^2 for females. Distance between consecutive locations differed significantly between denning and non-denning female bobcats. Juvenile ranges averaged 222.1 km^2 for three female bobcats. Dispersal was documented in two juvenile bobcats and an adult lynx. Placental scar counts indicated an average bobcat litter size of 2.69 and an average lynx litter size of 2.75. Corpora lutea counts indicated ovulation rates of 4.16 for bobcats and 4.28 for lynx. Both yearling bobcats and lynx implanted embryos. Pregnancy rate of yearling bobcats (39.4%) was significantly lower than that of adults (89.6%), and fluctuated greatly between harvest seasons. Lynx pregnancy rate was also lower for yearlings (44.4%) than adults (100.0%). Corpora lutea counts were significantly lower for yearling bobcats ($x = 3.62$) than adults ($x = 4.48$). Over half (55.7%) of yearling bobcats with corpora lutea present had no placental scars, but only 9.6% of adults had ovulated without implanting embryos. No significant differences were detected between litter sizes or ovulation rates for bobcats harvested in eastern or western Montana. Bobcat litter sizes and ovulation rates were significantly different between years and age groups. Bobcat breeding season lasted from mid-February through mid-April and kittens were born from early May to early July. Three wild litters located between 1982 and 1984 averaged 2.67 kittens. Bobcats used steep, rocky areas in association with Douglas fir (Pseudotsuga menziesii) for den sites, selecting hidden microsites within caves, spaces between boulders, hollow logs, or abandoned mine shafts. Den sites were often located near active secondary roads. Past disturbance, such as mining or logging activity, did not appear to influence den site selection. Kittens were not mobile until about 8 weeks of age, when more extensive ($> 2 \text{ km}$) movements began.

ABSTRACT

Dhungel, Sanat K., Ph.D., June 1985

Forestry

Ecology of the Hog Deer in Royal Chitwan National Park, Nepal (124 pp.)

Director: Bart W. O'Gara

Between 1981 and 1983, 95 hog deer were captured and measured; 21 were radio collared and monitored for 30 months. Maximum weights (mean for males = 42.7 kg; mean for females = 32.2 kg) and lengths (mean for males = 127.8 cm; mean for females = 120.6) were reached at 2-3 years of age. Males were 32.6% heavier than females. Sex ratios generally favored females. Groups of more than 20 deer were observed during February through April, after the first fires in the grasslands, but the basic social group consisted of an adult female and her juvenile offspring. The peak fawning season was March through April, but females gave birth from the end of January through April, about 7 months after copulation. Litter size was normally one, and the recruitment rate was estimated at 13%. Population densities of hog deer in the study area, estimated by various methods, ranged from 15.5/km² to 29.2/km² in tall grassland habitat to 0.13/km² in riverine forests. During all seasons, the deer fed in the mornings and evenings and bedded and ruminated during the hot part of the day. They were 41% active during the day and 26-29% active at night. Home ranges overlapped extensively and mean home ranges of females and males were estimated at 60 and 80 ha, respectively. Seasonal home ranges differed little from yearly home ranges. Home range shape was dictated by food and water. Small home ranges indicated that hog deer were sedentary, preferring grasslands where food, cover, and water were available. Habitat use based on transmitter locations, pellet group counts, and direct observations showed that hog deer preferred grasslands to sal and riverine forests. Foraging and feeding behavior, recorded inside an enclosure and from cafeteria trials, indicated that grasses, ferns, samal flowers, and vellor fruits were the most important food items. Saccharum spp., Imperata cylindrica, and Cynodon dactylon comprised 70% of the grass species available as food and cover with an average mean green biomass of 2.6 kg/m².



Ninety-five hog deer were captured in tangle nets during a recent study in Royal Chitwan National Park, Nepal. Twenty-one were radio collared and monitored for determination of habitat use. Home ranges overlapped extensively and females and males were estimated at 60 and 80 ha, respectively. Seasonal home ranges differed little from yearly home ranges. Home range shape was dictated by food and water. Small home ranges indicated that hog deer were sedentary, preferring grasslands where food, cover, and water were available. Habitat use based on transmitter locations, pellet group counts, and direct observations showed that hog deer preferred grasslands to sal and riverine forests. Photo by Sanat Dhungel.

Harvest Age-structure as an Indicator of Grizzly Bear Population Status (204 pp.)

Director: Lee H. Metzgar

Managers of harvested grizzly bear (Ursus arctos) populations face the problem of setting harvest regulations for a species with extremely low reproductive rates in the absence of reliable data on population abundance. Although harvest age-structure data are often cited as a means of determining the status of such populations, consensus is lacking regarding the best treatment of these data and sample sizes necessary for valid conclusions. This study examined simulated grizzly bear harvests, interpreted age-structures of populations relative to the sustained yield curve, developed an index to declining trajectory, and evaluated the sensitivity of the index.

Age-structures were generated by stochastic, discrete-time, age-structured projection models that followed the history of individual bears. Four models simulated slightly different mechanisms of population regulation via density-dependence. All satisfactorily simulated longevity of individuals, non-stationary age-structures, and synchrony of breeding.

Age-structures of harvested populations displayed 3 patterns with increasing harvest pressure: (i) sex ratios favored females, (ii) male age declined, and (iii) female age increased slightly. Although clearly evident in unexploited populations that were subsequently overharvested to extinction, differences in age-structures between populations above and below the sustained yield curve were virtually undetectable. Harvest age-structures exhibited high yearly variability and a substantial lag-time in their response to changing harvest rates.

Differences in harvest age-structures of declining and stable populations were summarized and quantified by 2-group discriminant function analysis. The power of the resulting discriminant index was estimated by setting the probability of erroneously classifying a declining population at 10%, and noting the percentage of stable populations correctly classified. Under circumstances typically confronting a manager, power of the index was low: with large sample sizes, just over 50%; with small sample sizes, about 20%.

Harvesting grizzly bears merely to obtain age-structure data for inferring population status was concluded to be a questionable practice. Decisions about harvesting small populations of grizzlies must be viewed conservatively, because harvests data contain inherent uncertainty. Managers must work in the context of risk rather than irrefutable quantitative evidence.

Differences in harvest age-structures of declining and stable grizzly bear populations were summarized and quantified by 2-group discriminant function analysis. The power of the resulting discriminant index was estimated by setting the probability of erroneously classifying a declining population at 10%, and noting the percentage of stable populations correctly classified. Under circumstances typically confronting a manager, power of the index was low: with large sample sizes, just over 50%; with small sample sizes, about 20%. Photo by Craig Jourdonnais.



Spring headfires produced greater standing crops of forbs than did fall headfires or cattle grazing during a study of the influences of prescribed fires and cattle grazing on an elk winter range in Montana.

Photo by
Craig Jourdonnais.

Nest Success and Cover Relationships of Upland-nesting Ducks in Northcentral Montana (35 pp.)

Director: I. J. Ball

Duck nest densities and nest success were studied in 5 cover types on the Bowdoin National Wildlife Refuge in northcentral Montana during 1982 and 1983. The cover types consisted of 4 range sites and dense nesting cover (DNC). Nests were located using a cable-chain drag. Visual obstruction of vegetation was measured at nest sites and at a point 6 m north of each nest. Hatch rates were calculated from daily survival rates. Of 367 nests located, 36% were gadwall (Anas strepera), 27% northern shoveler (A. clypeata), 12% blue-winged teal (A. discors), 12% lesser scaup (Aythya affinis), 7% northern pintail (Anas acuta), 5% mallard (A. platyrhynchos), < 1% American wigeon (A. americana), and < 1% redhead (Aythya americana). Nest density was highest in saline lowlands (1.06 nests/ha), followed by DNC (0.68 nests/ha), panspots (0.35 nests/ha), silty (0.19 nests/ha), and shallow clay (0.13 nests/ha). The average nest density for native grasslands was 0.31 nests/ha. Nest success averaged 49% for all cover types sampled. Nest success in DNC (28.3%) was significantly lower than in other cover types. Nest success in native grasslands averaged 76.1% in saline lowlands, 67.0% in shallow clay, 64.8% in panspots, and 49.8% in silty sites. Late nesting species showed a significantly higher nest success (65.4%) than early nesting species (34.6%). The primary cause of nest loss was depredation (67% of all unsuccessful nests, N = 100). Nest depredations were attributed to striped skunks (Mephitis mephitis) - 39%, red fox (Vulpes vulpes) - 22%, coyote (Canis latrans) - 12%, Richardson's ground squirrel (Spermophilus richardsonii) - 7%, raccoon (Procyon lotor) - 7%, avian - 5%, mink (Mustela vison) - 2%, and unknown predators - 6%. Mean visual obstruction of vegetation was significantly higher at nest sites than at a point 6 m north of each nest, indicating that hens chose nest sites in relatively dense patches within the mosaic of available grasslands. Management recommendations stress the importance of organism-defined habitat perception, passive predator control measures, periodic disturbance of native grasslands to maintain or improve the quality of nesting habitat, and stringent application of DNC establishment guidelines. The potential for duck production in portions of the arid mixed-grass prairie is higher than often has been recognized.

Prescribed Fire and Cattle Grazing Influences on the Vegetation and Elk Use of a Rough Fescue Community (100 pp.)

Director: Donald J. Bedunah

The emphasis of this research was to study the influences of fire and cattle grazing on specific vegetation characteristics and elk (Cervus elaphus) use parameters of a wolfy rough fescue (Festuca scabrella) grassland. Cattle grazing occurred during fall 1983. Burn treatments were backing fires and headfires during fall 1983 and spring 1984. Standing crop was measured from caged sites on all treatments during fall 1984. Elk use was measured from pellet group counts, counting numbers of plants grazed by elk, and clipping paired sites on all treatments during spring 1984 and 1985. Plant nutrient content analysis was conducted on rough fescue, Idaho fescue (F. idahoensis), and bluebunch wheatgrass (Agropyron spicatum) plants from all treatments. Total nonstructural carbohydrate (TNC) levels of rough fescue and Idaho fescue were also analyzed for all treatments. The effect of treatments on soil organic carbon content was determined.

Burn and cattle grazing treatments reduced rough fescue and total grass standing crop compared to controls. The spring headfire treatment produced greater standing crop of forbs compared to fall headfire and cattle grazing treatments. Total shrub standing crop was greatest on the cattle grazing treatment compared to other treatments. Burning and cattle grazing treatments were equally effective in reducing standing litter; whereas, fall burn and spring headfire treatments were most effective in reducing down litter accumulations. Burn and cattle grazing treatments increased elk use of rough fescue during winter 1985. Burn and cattle grazing treatments increased crude protein content of the 3 tested plant species compared to controls. Crude fiber content of the tested plant species varied considerably between collection dates. Differences in TNC levels of rough fescue and Idaho fescue were found between treatments. Peak TNC levels of both fescues was near the 20 July collection date. Wind erosion was more apparent on the fall burn treatments than other treatments. Burn treatments also had a trend of reduced organic carbon compared to grazed and control treatments.

ABSTRACT

Lee, Nancy K., M.S., December 1984

Wildlife Biology

Evaluating elk habitat in terms of cover in west-central Idaho
(56 pp.)

Director: Bart W. O'Gara *BWO*

This study, conducted in west-central Idaho from July through September 1982 and June through November 1983, evaluated elk cover on portions of the Payette National Forest. Timber strata were used as sampling units. For each strata, cover boards were utilized to measure hiding cover and vertical structure. Thermal cover was evaluated by field estimates of tree densities and canopy closure. Strata 24 and 25 (mature-overmature trees with 10-70% crown closure) provided hiding cover as well as some forage. Strata 21 and 22 (partial cuts with 10-100% residual stand cover) generally provided more forage than the other strata and also provided hiding cover. Thermal cover appeared to be the habitat component provided by strata 26 (mature with immature trees and 70-100% crown cover) and 35 (immature with mature trees and 70-100% crown cover). No direct correlation was found between hiding cover and use. When examining juxtaposition of strata, strata 24 and 25 were selected for and strata 20 (clearcuts) and 40 (non-productive forest land) were selected against when adjacent to areas of high use. Road density inversely affected elk use of most strata. Elk selected for dry habitat types but this may have been a function of pellet groups being less readily identified and more rapidly decomposed in the moist sites.

ABSTRACT

Mullen, Patrick D., M.A., 1985

Zoology

Reproductive Ecology of Ospreys in the Bitterroot Valley of Western Montana (58 pp.)

Director: Bart W. O'Gara

The population status and reproductive success of ospreys in the Bitterroot Valley of western Montana were studied during the 1983 and 1984 breeding seasons. These ospreys reproduced at a rate of 1.89 fledglings/active nest/year, a rate well above that (0.79-1.30) required for replacement, as calculated for other populations. Reproductive success did not differ for the 2 years of the study, and was not limited by food availability or human disturbance. Nest site characteristics were measured for the population and differed between pond and river habitats in the study area, though no differences in young fledged/active nest were found between habitats. More young fledged/successful pond nest than river nest in 1984 though reasons for this were not found. The growing phase of the population is similar for other areas of the western United States, and is probably a result of the discontinued use of DDT and the recent formation of reservoirs in these areas. Suitable nest trees appear to be present throughout much of the study area, although the possibility exists that nest sites may become limiting in the future. A continuation of current trends depends on sound habitat management and public education programs, both necessary to ensure a future for ospreys and other non-game wildlife species.



ABSTRACT

Matchett, Marc R., M.S., Fall 1985

Wildlife Biology

Moose-Habitat Relationships in the Yaak Country, Northwestern Montana
(195 pp.)

Directors: L. H. Metzgar and I. J. Ball

Logging began during the 1950's and is now the primary land use in the Yaak River drainage. The relationships between timber management and moose habitat were evaluated using 669 locations of 12 radio-collared moose (*Alces alces shirasi*) collected between January 1982 and September 1983. Habitat availability on the 450 km² study area was estimated with random points inside harmonic home ranges. On a year-round basis, moose use was greater than expected in: clearcuts, cuts less than 12 ha, cuts logged 15-30 years ago, or areas within 100 m of a cutting unit. Moose selected elevations below 1067 m in winter and above 1524 m in summer. During early winter moose are often in open areas, but during mid- and late winter they often use closed canopied stands. Implications of snow conditions (from snow hardness measurements at 42 stations) on moose habitat use and movement patterns are discussed. During summer, moose often cycle between upland core areas in spruce-logged basins and lowland aquatic feeding sites. Harmonic home ranges suggest similar sized use areas (3-5 km²) in all seasons. Winter home ranges are small areas that are used uniformly with a few sites receiving intensive use. Summer home ranges are small, disjunct use areas scattered over a large area. Minimum convex polygons (MCP) and other home range indices indicate that summer movements cover more than twice the area of movements in winter. Summer MCP's averaged about 25 km² and winter MCP's averaged about 10 km². A calf:cow ratio of 42:100 and a bull:cow ratio of 46:100 were estimated from observational data. A density of 0.11-0.20 moose/km² was estimated for the study area. It is felt that the population is at least stable and perhaps increasing, but additional information on trends, productivity, and mortality is needed. Maintaining a mosaic of small, 15-30 year old logged areas intermixed with mature, closed canopied, timbered stands combined with effective population monitoring and a continued road closure program will provide productive moose habitat and populations in the Yaak valley. Management recommendations are provided.



Snow depths averaged 80-90 cm in the Yaak Valley during January and February 1983, and a snowmobile was used to get in range for darting. Moose used densely timbered sites when snow crust layers were weak. Moose were quite mobile and used clearcuts when snow was light and powdery or when extremely hard crust layers were present.

Photo by
Randy Matchett.

Moose selected for clearcuts on a year-round basis in the Yaak Valley of northwest Montana. Thickly timbered sites were also important, especially in winter and as calving sites. Good moose range in northwest Montana contains a mosaic of small cutover areas and mature timber.

Photo by
Rick Levesque.





M99 was used to immobilize 12 free-ranging moose in the Yaak Valley in extreme northwestern Montana. Radio-location data showed that moose ranged over 50-72 km² annually. Summer home ranges covered 25 km² and winter home ranges were limited to 10 km².

Photo by
Randy Matchett.

Recovery times of moose immobilized with M99 averaged 10 minutes after injection of M50-50. Darting when there was continuous snow cover was least stressful to moose and advantageous for researchers. Snow hindered moose mobility, supported them after immobilization, minimized the over-heating side effect of M99, and allowed researchers to find drugged animals quickly by tracking.



Photo by
Randy Matchett.

Completion Report--Testing of Grizzly Bear Trend Monitoring Techniques

Bart W. O'Gara and Richard Harris

During phase 1 of the study, hair-grabbers made of Howard's wool-card material were used by Montana Department of Fish, Wildlife and Parks biologists during their annual black bear bait-station surveys. Eight of a total of 48 stations equipped with hair-grabbers were visited by bears; two of these produced enough hair to attempt a species identification.

In phase 2, scent-station lines using a commercial attractant scent were run in a study area west of Hungry Horse Reservoir. Response from bears was poor. Of 154 stations run during 1,078 station-nights, only two were known to have been visited by bears. Of the two successes, one of the visiting bears was judged to be a grizzly.

In phase 3, scent-stations (including alternative attractants) were run in a study area in extreme southwestern British Columbia where 12 grizzly bears were operating radio-collars placed by a British Columbia researcher, Bruce McLellan. The response of known grizzly bears to stations was again poor; three stations were visited during 376 station-nights, despite 59 known instances that grizzly bears were within 1 km of a station. On at least five of these occasions, known grizzlies traveled on roads directly past scent-stations without responding. It was concluded that nonconsumable attractants were unable to produce high enough visitation rates from grizzly bears for this type of scent-station trend monitoring method to yield interpretable results.

Completion Report--Preliminary Investigations of Pronghorn in Baja California Sur

Bart W. O'Gara, Sam Linhart, and Jo Meeker

The population of peninsular pronghorns is building, probably because of a break in the 7-year drought that had plagued the Viscaïno Desert, and the population is now estimated at 90 animals. Predator control, instituted with the help of DWRC, may have contributed to the improved survival of fawns.

The wildlife manager at Guerrero Negro stated that, although rainfall had been above average, he felt that predator control has been the primary reason for increased fawn survival. Experience gained by the observers may also attribute to some of this increase.

A graduate student, Jo Meeker, carried laboratory equipment to La Paz and helped install it. He taught three laboratory technicians the procedures for determining pronghorn diet through fecal analysis. The procedures taught were those used by Colorado State University. Pronghorn diet determination is the first step in the SEDUE Plan for the recovery of the pronghorn in Baja California. The second planned step is the determination of carrying capacity of the present pronghorn range. The ultimate goal is the expansion of the present range to occupy as much as possible of the historic pronghorn range in Baja. Further funding for this project has not been secured so it will be terminated at the end of 1985.

Completion Report--Status, Management, and Recovery Potential for
Gray Wolves in Central Idaho

Bart W. O'Gara, Jerome Hansen, and Timm Kaminski

A final report entitled "Wolves of Central Idaho" was submitted to the U.S. Forest Service and U.S. Fish and Wildlife Service by Kaminski in 1984. The report reviews the historical distribution of gray wolves in Idaho, their current status, and recovery potential in the Frank Church-River of No Return and Selway-Bitterroot wilderness areas.

Research results and reports through mid-1985 suggest that 12 to 15 wolves remain in Idaho. Wolves travel predominantly alone (80% of reports) or in two's (15%), but seldom in packs (5%). No reproduction was reported in 1985. Numbers of ungulate prey animals reported present in the central Idaho Wilderness areas by the Idaho Department of Fish and Game are adequate to support about 220 wolves. Planned entry into roadless areas where wolves remain, increasing development, and current levels of land use indicate a more reasonable estimate of 60 to 80 wolves. Current prey numbers combined with habitat evaluation results show that the central Idaho Wilderness area, the largest in the lower 48 states, is capable of supporting a viable wolf population. Most national forest personnel are using information from "Wolves of Central Idaho" (1984) in the forest planning process to promote wolf recovery in this area.

No wolf activity was confirmed in northern Idaho and adjacent areas during field investigations conducted by Hansen from January to March 1985. Field work consisted of both on-ground investigation and aerial surveys. During the study, 135 reports of wolves, or their sign, were collected from northern Idaho and 39 from northeastern Washington. Ease of access to several areas in northern Idaho make the evaluation of reports difficult because of the possibility of large dogs. However, based on the detail of some reports and the experience of observers, a few wolves apparently occur in northern Idaho and northeastern Washington. These animals are probably in a transitory mode and dispersing from Canada.

The nearest viable wolf populations are 150 to 200 miles north of the U.S.-Canadian border. Based on track reports and occasional observation of live animals, wolf numbers are slowly increasing in the East Kootenay region of British Columbia, directly north of the border. However, pack activity has not been reported in this region. Although probable wolf reports have been scattered across the study area, it appears that the Idaho-Montana border area has the most potential to provide a secure travel corridor for wolves dispersing from Canadian wolf populations toward the central Idaho wolf recovery area. Much of the border area is at high elevations with heavy snow accumulations during winter. Both wolves and their prey (ungulates) get funneled into areas of increased human activity during winter months, resulting in increased potential for human-caused wolf mortality.

The distance that wolves must travel from viable populations in Canada to central Idaho, along with human persecution during dispersal, combine to limit the chances of wolf recovery in central Idaho. Careful management of a travel corridor along the Idaho-Montana line from Canada will be critical if natural recolonization is to remain a feasible means of wolf recovery in central Idaho.

Completion Report---Trapping Methods for Columbian Ground Squirrel
Control

B. W. O'Gara and S. L. Olson-Edge

A study to determine the relative effectiveness of three trap types for Columbian ground squirrel (Spermophilus columbianus) control was conducted during May and July, 1985, in Missoula County, Montana. A Two-way Analysis of Variance was used to test for differences in percent reduction of burrow and activity indices between conibear, box and livetraps versus controls by month. All trap types significantly reduced ground squirrel numbers when compared to the controls for each month, but no trap type was significantly more effective than the others. Trapping in May causes undetected mortality of young, but baits are less palatable because of a preference for succulent forage. Ground squirrels are more easily caught in July; trapping during both months is recommended for maximum reduction in ground squirrel populations.



A gray wolf on the Idaho side of the Idaho-Montana border west of Missoula, Montana. The high, rugged border area is a possible travel corridor for wolves moving from Canada to central Idaho.
Photo by Mike Schlegel.

Completion Report---Evaluation of Scarecrows for Frightening
Golden Eagles from Lambing Herds

B. W. O'Gara, M. R. Matchett, and D. Pond

The Rebish-Konen (RK) and Helle-Rebush (HR) ranches near Dillon, Montana suffered extensive lamb (*Ovis aries*) losses from depredations by golden eagles (*Aquila chrysaetos*) during the 1974 and 1975 lambing seasons when jackrabbits were scarce. From 1976 to 1981, low levels of predation were documented and eagles were live-trapped and relocated by the U.S. Fish and Wildlife Service. In 1982, depredation increased slightly from the level during the previous 4 years. Eagles were trapped and relocated in 1983 and biologists experimented with eagle chitter and distress calls, but could not frighten eagles from sheep carcasses. Initial tests of scarecrows and ground harassment (rifle shots or crackershells near birds) were conducted in 1984 and apparently reduced or eliminated eagle depredations on lambs. Scarecrows and harassment provided some degree of protection and was economically feasible, but another test season was needed.

The HR ranch traditionally had fewer eagles than the RK ranch. Minimizing depredations with use of scarecrows and harassment was the priority at the HR ranch in 1985. The efficacy of scarecrows and harassment was experimentally tested at the RK ranch. Nine eagles were caught on the RK ranch with a helicopter and Coda net gun in early May, 1985. These birds were banded and instrumented with radio transmitters. The capture method was experimental, but proved to be effective when eagles had fed and winds were minimal. Lambing peaked in late May and early June. Eleven scarecrows were erected on the RK ranch on 21 May and 18 on the HR ranch during the last week of May. No scarecrows were erected on half of the RK ranch which served as a control.

Individual, minimum convex polygons (MCP's) averaged 230 km² (7 eagles, 101 locations) from May to mid-July. These large home ranges made it difficult to show eagle avoidance of scarecrows. Eagles were frequently sighted on both halves of the RK ranch prior to scarecrows and harassment. Sightings of eagles on the scarecrow area of the RK ranch decreased and correspondingly increased on the control area. Relative to the number of lambing ewes, more carcasses were found in the scarecrow area than in the control area, but those found in the control area suffered a higher eagle predation rate.

Trapping and relocation of eagles is expensive and is not effective. Short of killing eagles, which is illegal, or altering lambing operations, scarecrows and harassment are the best means available to prevent eagle predation on lambs. Increased human activity in and around lambing bands with a few rifle or shotgun shots makes birds wary. Ranchers that use scarecrows and increase human activity in and around lambing herds will decrease eagle predation rates with minimal expenditures. If catastrophic predation occurs, the helicopter and net gun capture technique appears to be an efficient means to remove depredating eagles.



Capture of golden eagles with a helicopter and Coda net gun proved effective when the eagles had fed or winds were minimal.

Photo by Randy Matchett.

Seven of nine golden eagles captured on a ranch in southwestern Montana and instrumented with radio transmitters remained on the ranch. Their ranges averaged 230 km² from May to mid-July. After erection of scarecrows, numbers of eagles decreased on that part of the ranch but increased in the control area. A young bird is being released here after being instrumented.

Photo by
Randy Matchett.





RESEARCH PROJECTS

Physiologic and Ecologic Studies of the Pronghorn (Antilocapra americana)

Project Leader: B. W. O'Gara

Cooperators: National Bison Range, U.S. Fish and Wildlife Service; Yellowstone National Park, U.S. National Park Service; and the Montana Fish, Wildlife and Parks Department

Objectives:

To study:

1. the reproductive physiology of male and female pronghorn;
2. the physiology and function of scent glands;
3. food habits related to changes in range conditions;
4. horn growth and casting; and
5. the relationships of pronghorns to other artiodactyls.

Results:

Six chapters for the Wildlife Management Institute pronghorn book are ready for the editor. Work continues on four others.

Population Studies of Canada Geese in the Flathead Valley

Project Leaders: J. J. Craighead and I. J. Ball

Cooperators: USFWS; Montana Dept. Fish, Wildlife and Parks; BIA/Confederated Salish & Kootenai Tribes

Objectives:

1. To gather current data on populations, nesting areas, and nest success of Flathead geese.
2. To compare the current situation with conditions documented during 1953-60.
3. To relate changes in reproductive output of the geese to changes in habitat or management strategies since the 1950's.
4. To prepare a monograph using both historical and current data.

Results:

A draft of a monograph has been completed.

Pronghorn Antelope Behavior in Northwestern
Nevada-Southeastern Oregon

Project Leader: B. W. O'Gara
Student Investigator: J. O. Meeker
Cooperators: Sheldon-Hart National Wildlife Refuge,
Double Four Corporation, NRA

Objectives:

1. Determine seasonal movements of pronghorns that summer on Hart Mountain and Sheldon refuges.
2. Determine breeding strategies used by pronghorn with home ranges in different habitat types.
3. Determine selected trace element content of vital organs and hair of pronghorn taken at Hart Mountain and Sheldon refuges.
4. Compare Hart-Sheldon trace element data with hair taken from Idaho and Montana pronghorns.

Results:

The student took time off from completing his dissertation to help biologists in LaPaz, Baja Sur, establish a fecal analysis laboratory and train them in analysis techniques.

White-tailed Deer Winter Habitat Selection in
a Western Montana Second Growth Forest

Project Leader: B. W. O'Gara
Student Investigator: K. Berner
Cooperators: Mission Oriented Research Program (Montana
Forest and Conservation Experiment Station);
Montana Department of Fish, Wildlife and
Parks; National Rifle Association

Objectives:

1. To determine if forest structures and habitat types are used by deer during early and late winter in proportion to their occurrence.
2. To determine if forest structures and habitat types used during the day and night differ.

Results:

The student investigator organized and analyzed data during the fall and winter quarters. Home ranges of radio-collared deer were plotted by time of day and season, and home range sizes were calculated. A draft was completed for the majority of the thesis, with several reviews being conducted by faculty members. The project will be completed in the fall of 1985.

Recovery of a Ground Squirrel Population Following Applications
of 1080 and Effects of the Poisoning Program on Coyotes

Project Leader: B. W. O'Gara

Student Investigator: T. Lingel-Pate

Cooperators: Montana Department of Agriculture, Environmental Management Division; Missoula County Rodent Control Board; Montana Department of Fish, Wildlife and Parks; U.S. Fish and Wildlife Service, Denver Research Center

Objectives:

1. Measure the degree of ground squirrel reduction achieved by 1080 poisoning.
2. Quantify reproductive performance in treated and untreated ground squirrel populations.
3. Compare dispersal rates of young (juvenile and yearling) squirrels between treated and untreated populations.
4. Identify the source of immigrants that appear on treated areas.
5. Measure coyote population fluctuations on treated and control areas.
6. Investigate utilization of poisoned squirrel carcasses by ravens and coyotes, and associated mortality.

Results:

The student investigator is working on his thesis. The Abstract should appear in the next Annual Report.

Duck Production Relative to Nest Predation
and Habitat Condition on the Prairies

Project Leader: I. J. Ball

Student Investigator: Numerous (9)

Cooperators: Northern Prairie Wildlife Research Unit,
Migratory Bird Management Office

Objectives:

1. Determine duck nest success and causes of losses.
2. Band ducks for assessment of survival rates and movements.
3. Provide Unit students with training in waterfowl research techniques.

Results:

Nesting surveys have been completed in Canada. Five Unit students are currently (September 1985) banding in Canada.

The Yaak Moose: Habitat Relationships
and Population Status

Project Leader: L. Metzgar

Student Investigator: B. Costain

Cooperators: Montana Department of Fish, Wildlife and
Parks; Louisiana Pacific Corporation;
J. E. Davis; Kootenai National Forest

Objectives:

1. Document habitat selection by moose in the Yaak River drainage and identify habitat components of significance.
2. Delineate seasonal movements and home ranges.
3. Estimate population densities and productivity.
4. Assess the impact of human activities--logging and hunting in particular--on these first three groups of parameters.
5. Develop guidelines that integrate timber stand manipulation with moose habitat management, and suggest ways of monitoring population trends.

Results:

The Yaak Moose Project was initiated in 1981. During this final field season, one or two workers have been in the field for a total of 9 months (fall 1984, winter and summer 1985). Habitat selection and movement patterns are being investigated through daily radio-tracking of eight collared moose (two bulls and six cows with nine calves). Since September 1985, 630 new radio locations have been added, bringing the study total to 1680. Fine-grained habitat use and activity patterns are examined through continuous (24-hour) monitoring of individual moose. An additional 20 sessions have been conducted with 24 animals since last August.

Detailed habitat evaluation of several hundred radio points and random points is proceeding in the field. Potentially critical habitat features such as calving sites, aquatic feeding sites, and units of thermal cover are being examined in detail. A series of snow depth and hardness measurements in habitats frequented by moose was made during the past winter.

Population densities are estimated from ratios of collared/total animals sighted on the study area. In the past year, 202 fortuitous sightings of adult moose were made. Preliminary aerial surveys of aquatic sites were conducted in July with the help of the Montana Department of Fish, Wildlife and Parks.

Intensive radio tracking and continuous monitoring will be concluded in mid-September. Habitat sampling will continue into October. Data analysis will proceed through the winter, and a final report is expected in 1986.

Ecology of Bobcats in Southeastern Idaho Relative to Human
Exploitation and a Black-tailed Jack Rabbit Decline

Project Leader: I. J. Ball

Student Investigator: S. T. Knick

Cooperators: U.S. Department of Energy, U.S. Fish and
Wildlife Service, Idaho Department of Fish
and Game

Objectives:

1. Determine the effects of harvest on bobcat populations.
2. Document bobcat responses to a black-tailed jack rabbit population decline.

Results:

One yearling male bobcat marked near Arco in April 1983 was trapped southeast of Salmon, Idaho. The minimum distance traveled as determined from radiotelemetry was 202 km; the straight-line distance between captures was 158 km.

Of the 10 radio-tagged bobcats monitored in September 1984, four were harvested, radio-contact was lost with one in November, and two starved to death due to a severe winter coupled with a low prey base after the jack rabbit decline. The remaining three bobcats are males.

Trapping will continue through next fall to mark any bobcats on the unharvested study area and to estimate bobcat density for the fourth consecutive winter after the jack rabbit peak and subsequent decline in 1981. Bobcat densities on the unharvested study area have declined from 9 bobcats/100 km² in winter, 1982, to 5.5 in 1983, and 3 in 1984. Preliminary estimates based on the remaining radio-collared bobcats and track observations are that bobcat density is now 1/100 km².

The student spent summer 1985 in the field and will return for coursework at the University of Montana beginning in the fall. Most effort is now directed toward data analysis and writing. Completion of all phases of this project is expected by summer 1986.



Movements, Food Habits, and Radionuclide Transport
by Black-tailed Jack Rabbits on the INEL Site

Project Leader: I. J. Ball
Student Investigator: J. C. Grant
Cooperators: U.S. Department of Energy--INEL Site
Objectives:

1. Document the number of jack rabbits utilizing a radiation waste disposal site on a seasonal basis.
2. Determine daily and seasonal movement patterns of jack rabbits on and around the site.
3. Determine food habits of jack rabbits on and around the site and describe habitat components of the site that attract rabbits.
4. Document radionuclide concentrations in jack rabbits on the site and on a control area.

Results:

Seasonal fluctuations in jack rabbit numbers at the Radioactive Waste Management Complex were evident throughout the study. Densities were highest during summer and essentially zero, because of emigration, in winter. Annual densities also varied. Estimates from 1 July to 30 June based on fecal pellet accumulations were 1.3 jack/ha in 1982-83, 0.4 jack/ha in 1983-84, and 0.2 jack/ha in 1984-85. No jack rabbits were radio-tracked during the past year because of difficulties in capturing rabbits at low densities.

Two plants, Agropyron desertorum and Kochia scoparia, which grew primarily in disturbed sites, such as the Subsurface Disposal Area, were the two most commonly occurring species in jack rabbit diets. Concentrations of radionuclides in tissues of jack rabbits killed in the area, however, were not significantly different than concentrations in control jack rabbits.

Analyses of data and writing of thesis are proceeding. Completion of the project is expected in the fall of 1985.

Beaver Populations on Impounded and Unimpounded Rivers:
Densities, Habitat Profiles, and Mitigation Strategies

Project Leader: B. W. O'Gara
Student Investigator: R. Bown
Cooperator: Montana Power Company

Objectives:

1. Determine beaver population levels and patterns of habitat use on the Carter Ferry study area.
2. Compare population densities on impounded and unimpounded river segments.
3. Develop a "profile" of occupied habitat along impounded and unimpounded river segments.
4. Predict the effects of anticipated water levels on the availability of potential beaver habitat after completion of the Carter Ferry Dam and identify possible mitigation measures.

Results:

The student investigator completed extensive habitat measurements on 60 random and 21 lodge sites on the Carter Ferry study area. Data analysis is progressing.

Aerial winter cache counts were completed for the Missouri River from Morony Dam to Dauphin Rapids (approximately 215 km); Morony, Ryan, Cochrane, Rainbow, Canyon Ferry, and Tiber reservoirs; Hauser and Holter lakes; and the Marias River below Tiber Dam. The Missouri River averaged 0.34 caches/river km. Reservoirs varied from no activity to 0.20 caches/shoreline km.

Rocky Mountain Trumpeter Swan Project

Project Leader:	I. J. Ball
Research Associate:	R. E. Gale
Cooperators:	U.S. Fish and Wildlife Service, Region 6; Montana Department of Fish, Wildlife and Parks; Idaho Fish and Game; Wyoming Game and Fish; The Trumpeter Swan Society

Objective:

Utilize available published and unpublished information to produce a scientific document on Trumpeter Swans of the Rocky Mountain Population that is suitable for use by managers and for publication.

Results:

Data sets for Red Rock Lakes NWR, 1935-85, have now been completed for the following variables: annual swan production (number nests, mean clutch size, percent hatch, percent cygnet survival, number cygnets fledged), number of nests on each Refuge lake, hatching dates, percent egg fertility, nest success, September mean brood sizes for all areas in Tristate region, Tristate September and winter census results, winter feeding (amounts, dates, and methods), freeze-up and thaw dates, removals of eggs, cygnets, and adults, actual cygnet production adjusted for removals, monthly and annual precipitation, snow course measurements, lower structure water gauge readings, temperature, precipitation events, and composition and production of aquatic vegetation species in tons by lake.

Population Status, Distribution and Habitat
of the Beaver in Northwestern Montana

Project Leader: L. Metzgar
Student Investigator: A. L. Easter-Pilcher
Cooperators: Montana Department of Fish, Wildlife and
Parks

Objectives:

1. Determine population status and relative densities of beaver populations within diverse habitats on selected rivers and lakes in northwestern Montana.
2. Review and compile trapping data and historical records (aerial photos, sightings, etc.) of these areas to determine historical beaver use.
3. Develop a habitat classification system for lacustrine and riverine habitats in northwestern Montana.
4. Correlate productivity with the developed habitat classification system and validate its use in predicting maximum density for beaver within these habitats.

Results:

Field work on project began 1 July 1985.

River Otter Population Status and Habitat
Selection in Northwestern Montana

Project Leader: L. Metzgar
Student Investigator: A. E. Dronkert
Cooperators: Montana Department of Fish, Wildlife and
Parks

Objectives:

1. Assess the status, distribution, and relative densities of otter populations in northwestern Montana.
2. Determine habitat selection of river otters and identify key characteristics of activity centers.
3. Classify lacustrine and riverine habitats in northwestern Montana, and identify and map suitable otter habitat.
4. Correlate otter densities with a habitat classification model and validate its use in predicting densities of river otter populations.
5. Identify factors limiting expansion of otter populations in northwestern Montana.

Results:

This project was initiated on 1 July 1985. Preliminary field investigations, habitat evaluations, and sign surveys have been instigated. Field work will continue through fall of 1986.

Distribution, Ecology, and Management of
Wolves in Northwest Montana

Project Leader: R. R. Ream

Technicians: M. Fairchild and D. Boyd

Cooperators: U.S. Fish and Wildlife Service; Montana
Department of Fish, Wildlife and Parks

Objectives:

1. Describe the distribution and status of wolves in northwest Montana.
2. Determine food habits and movements of wolves in a colonizing wolf population.
3. Determine what factors may be limiting wolf recovery in northwest Montana.
4. Provide management recommendations for the recovery of wolves and resolution of wolf-human conflicts.

Results:

During August 1984, a young adult male wolf was captured and radio-collared in British Columbia, 5 miles north of Glacier National Park. His travels have ranged from 30 miles north of the border to 30 miles south of it. The majority of his time is spent in the North Fork of the Flathead watershed. During the winter he restricted his movements to a fairly small area encompassing a deer/elk winter range in Glacier Park. From snow tracking and aerial observations he seemed to be alternately alone and paired with another wolf through the fall and winter. During spring, he was consistently with a second wolf with whom he was seen in May. It is not known if they attempted to breed, but no litter was raised by them.

A pack of five or six wolves were snow tracked from November 1984 to March 1985. While the full extent of their territory could not be defined just by track encounters, they were found to travel regularly into the northwest corner of Glacier Park and adjacent lands west of the Park boundary. From scats collected while tracking, it was determined that deer, elk, and moose are all important components of the pack's diet.

During May 1985, the alpha female of this pack was inadvertently captured in a bear snare by a Canadian biologist. He kindly obtained a radio collar from our camp and fitted it on the wolf before releasing her. Radio tracking of this female soon revealed the location of her homesite. Seven wolf pups were observed on a late May radio-tracking flight. The litter was at this site along the North Fork of the Flathead River bottom through early August. They have since moved across the River, still in Canada, about 10 miles north of the border.

Howling with the wolves at the homesite by researchers never resulted in more than two adults responding. Frequent wolf reports from Glacier Park suggest that some of the pack members from the previous winter have moved south into the Park, at least for the

summer. During this same period, the radio-collared male has been at the headwaters of the Flathead, 30 miles north of the border. Howling of a pair of wolves has been heard this summer from the area where this young male's radio signal was emanating.

Frequent reports of wolf tracks and sightings from the east side of Glacier Park suggest the presence of resident wolves there. A plaster cast of a wolf track by project volunteers this past spring validates many of the reports as wolf (vs. coyote and dog).

In September 1985, we will try to radio collar more members of the pack north of the border, including pups. This will greatly facilitate the study of reproduction, mortality factors, prey relationships, dispersal, and wolf-human interactions.

More intensive survey work will be carried out on the east and southern periphery of Glacier Park as well as other areas with frequent wolf reports.

Analysis and Modeling of Grizzly Bear Population Trends

Project Leader:	L. H. Metzgar
Research Biologist:	R. B. Harris
Cooperators:	U.S. Fish and Wildlife Service, Region 6, Grizzly Bear Recovery Coordination Office

Objectives:

1. Determine the accuracy and precision of calculations of grizzly bear harvest rates from age-related changes in harvest sex ratios.
2. Develop a flexible version of a stochastic grizzly bear population simulator for use on micro-computers.
3. Determine sustainable yields for modeled grizzly bear populations.

Results:

Bias and accuracy of a method proposed by Fraser et al. 1982 (Wildl. Soc. Bull. 10:53-57) for calculating harvest rates of bears from harvest data were evaluated using deterministic and stochastic computer models. Significant biases resulted whenever one of four critical assumptions were violated. Additionally, sample sizes of less than 60 bear harvested/year were concluded to be insufficient to produce harvest rate estimates with error less than 5%.

Building of a flexible version of a stochastic bear population simulation model is on-going. We anticipate completion by October 1985. A users' guide will be written to accompany the model.

Sustainable yields of modeled grizzly bear populations were determined using an older version of the stochastic simulation model. Results of these computations were forwarded to the Montana Department of Fish, Wildlife and Parks for their consideration.

Nest Abandonment and Brood Ecology of Canada Geese
on Ninepipe National Wildlife Refuge

Project Leader: I. J. Ball

Student Investigator: S. J. Sovey

Cooperators: National Bison Range; Confederated Salish
and Kootenai Tribes, Bureau of Indian Affairs

Objectives:

1. Document the number of territorial pairs and number of nests on Ninepipe Reservoir.
2. Investigate possible cause(s) of relatively high rates of nest abandonment on the Reservoir including: gull-geese competition, intraspecific competition, fluctuation in water levels, and chemical contamination.
3. Evaluate the efficiency and cost of various methods for censusing territorial pairs and broods.
4. Document brood ecology on the Reservoir:
 - a. survival,
 - b. habitat use relative to brood age and to burning, and
 - c. behavior--particularly gangbrooding.

Results:

The student attended classes from September to March and was hired as a cooperative education student with the Fish and Wildlife Service in May. The final field season began 1 April and finished 30 June.

This season Ninepipe Reservoir supported 72 goose nests. Forty-six (70%) known-fate nests were successful and 6 (9%) were abandoned. Observations of 29 nests were made from 10 April to 11 May. Two nests were classified as abandoned during the 310 hours of observation time.

Water levels fluctuated a great deal more this year than during last year and goose nesting success in relation to this was monitored. Three nests were flooded due to rises and nine nests were depredated due to drops in water level. No nests were abandoned prior to depredation when water levels dropped.

Pair counts and nonbreeding bird numbers were monitored and departure for molt migration was documented.

Broods were monitored from 8 May to 30 June and 20 brood surveys were conducted. Six pairs were observed to have gangbroods. Twenty-five acres of upland were burned to improve brooding habitat and goose activity on this area was monitored. Brood use of habitat relative to activity and gosling age was documented.

One hundred twenty-four fecal pellet density transects established in 1984 were sampled again this year. The data will help determine relative habitat use by geese in relation to vegetation and proximity to water.

Data from 1984 were entered into the computer and preliminary analyses begun. Data from 1985 have not been entered to date. Completion of the thesis is expected by March 1986.

Grizzly Bear Distribution Trends in Relation to
Human Use in Glacier National Park, Montana

Project Leaders: B. O'Gara and C. Servheen
Student Investigator: S. Nadeau
Cooperators: Glacier National Park, National Wildlife
Federation, NRA, USFS, National Parks and
Conservation Association

Objectives:

To determine:

1. grizzly bear seasonal observation trends Park-wide along trails, trail sections, and campgrounds;
2. if major weather patterns affect seasonal distribution of bears; and
3. if distribution of bear sightings in relation to Granite Park Campground are dependent upon time of day, season, and human presence.

Results:

Five years of observation records in Glacier Park were reviewed and 200 grizzly confrontations and about 1800 backcountry grizzly observations were gleaned from these data. The data were then recoded and entered into the University Computer System. All confrontations and observations were subsequently separated by months and plotted on a base map of the Park. Individual confrontation sites and areas where observations were concentrated were visited this summer to obtain site specific information. Forest Service grizzly bear component mapping data and additional trail situation data were collected at each site visited. Habitat was mapped along trail sections. The student investigator has completed his course work and data collection. Data analyses and thesis writing will be conducted fall 1985 through spring 1986.

An Evaluation of Elk-Livestock Interactions
in Central Idaho

Project Leader: B. W. O'Gara
Student Investigator: S. P. Kratville
Cooperators: Idaho Department of Fish and Game; U.S.
Forest Service; Bureau of Land Management

Objectives:

1. Document movements of radio-marked elk in relation to cattle distribution on spring, summer, and fall ranges.
2. Determine habitat use by radio-marked elk in relation to cattle distribution on spring, summer, and fall ranges.
3. Compare the nutritional well-being of elk subjected to livestock disturbance with that of undisturbed elk (DAPA method).
4. Develop year-round DAPA profiles for the wintering elk herd at Willow Creek Summit.

Results:

Field work was initiated during June 1985. Twenty-four radio-collared cow elk are being monitored from aerial surveys. (Elk were previously radio-collared by above mentioned cooperators.) Habitat typing, elk and livestock locations, and pellet collections are in progress.

Effects of Motorized Road Use on Grizzly Bear Behavior, Habitat Use, and Reproductive Success

Project Leader:	B. W. O'Gara
Technicians:	B. N. McLellan and R. D. Mace
Cooperators:	U.S. Fish and Wildlife Service, Region 6, Grizzly Bear Recovery Coordination Office

Objective:

Assess effects of road use on grizzly bears.

Results:

Fourteen grizzly bears captured in southern British Columbia, Canada, during 1984 were relocated 1090 times to determine use of habitat in relationship to open roads and seismic activity. Roads were classified as primary, secondary, and tertiary. Traffic levels were sampled on 184 occasions. Bear locations were classified by distance to each road type: < 100 m, 100-250 m, 250-500 m, 500-1000 m, and > 1000 m. The G-test was used to compare use and availability during each season. Confidence intervals were calculated using the Bonferroni approach.

During spring, eight of nine bears used the area closer than 100 m less than available--four significantly so. No difference in the three road categories was found. Similar results were found during summer and autumn. As expected, roads were not the only factor influencing a bear's location, and analyses were conducted on the location of habitat units in relation to roads. Nocturnal distances to roads were less than diurnal ones but not significantly so. We believe that as sample sizes increase, significant differences may be found. Data indicate that 8.5% of the total area is lost to bears because of road avoidance.

Population Genetic Structure of Westslope Cutthroat Trout:
Genetic Variation Within and Among Populations

Project Leader: F. W. Allendorf
Student Investigator: R. F. Leary
Cooperators: Montana Department of Fish, Wildlife and
Parks

Objectives:

1. Identify remaining genetically pure populations of westslope cutthroat trout in Montana.
2. Quantify the amount of genetic variability that exists within and among these populations.
3. Clarify the genetic relationship of westslope cutthroat trout to other trouts of the genus Salmo native to western North America.

Results:

The maintenance of genetic variation is a primary goal of many salmonid fish broodstock management programs. Broodstocks are often spawned over a 2-month time period at 1- to 2-week intervals. If there are substantial genetic differences among the various 'takes,' then the genetic variability of the broodstock cannot be maintained by retaining individuals from only a few takes to serve as future brood fish.

Electrophoretic analysis of the protein products of 46 enzymatic loci indicates that there are substantial genetic differences among the progeny from the various takes in two broodstocks of rainbow trout. In the Arlee strain, there are statistically significant differences (contingency table chi-square; $P < 0.05$) among the allele frequencies at four of the 12 variable loci among six takes spawned at 2-week intervals. Similarly, there are statistically significant differences among the allele frequencies at four of the 10 variable loci among nine takes of the Eagle Lake strain of rainbow trout spawned at weekly intervals. In both strains, the early and late takes have significantly less heterozygosity averaged over all the loci than the middle takes. These data indicate that progeny from many takes, especially the middle ones, must be retained as future brood in order to maintain the genetic variation of the broodstocks.

Elk-Cattle Interactions on the Wall Creek Allotment

Project Leader: B. W. O'Gara
Student Investigator: S. J. Gniadek
Cooperator: U.S. Forest Service, Forest and Range
Experiment Station

Objective:

Evaluate habitat relationships between cattle and elk.

Results:

Four pellet transects (one in each pasture), totalling approximately 24 miles in length, were established and surveyed 4-5 times for elk and cattle droppings during the first field season of 1984. Additional observations of cattle distribution were recorded on standardized forms for use in developing the cattle behavioral/distributional model. Locations or observations of radio-collared, neckbanded, or unmarked elk were also recorded. Results of the pellet transects from the first field season have been computerized and tentatively analyzed for patterns of use by both cattle and elk.

During the current field season, the student investigator has so far surveyed each transect 2-3 times, with modifications to the transect segments to better define the importance of habitat edge to the ungulates under investigation. Observations of cattle and elk distribution have continued as well.

Results from the most recent transect run revealed a movement of elk out of the first pasture grazed by cattle, while elk use remained high in an adjacent ungrazed pasture. Elk use of the entire study area has been sporadic, due perhaps to the abundant adjacent habitat not grazed by cattle.

Field work will continue until mid-September and completion of the project is expected during spring 1986.

Mule Deer Use of Missouri River Breaks
Habitat in Central Montana

Project Leader: B. W. O'Gara

Student Investigator: S. K. Kraft

Cooperators: Montana Power Company; Montana Department of Fish, Wildlife and Parks

Objectives:

1. Determine distribution, habitat use, and movement patterns of mule deer on lands adjacent to the proposed Carter Ferry Hydroelectric Project.
2. Evaluate habitat quantity, quality, and intensity of use.
3. Assess potential impacts of the project on mule deer and deer hunting opportunities.

Results:

The student took time off from the project during the summers of 1984 and 1985 to band ducks in Canada for the U.S. Fish and Wildlife Service. She attended classes fall quarter and analyzed data during winter and spring quarters. Each chapter within the thesis is being written in manuscript format suitable for publication. The introductory chapter and a chapter on use of agricultural lands by mule deer have been completed. The student is currently working on the remaining chapters covering habitat use, home range and movement patterns, and potential impacts of hydroelectric development. The thesis should be completed during fall 1985.

Habitat and Status of the Rocky Mountain Goat in the Snake River Range, Idaho

Project Leader: B. W. O'Gara

Student Investigator: J. A. Hayden

Cooperators: Idaho Department of Fish and Game; U.S.
Forest Service, Targhee National Forest

Objectives:

1. Estimate the present number and age and sex composition of the goats inhabiting the Snake River Range.
2. Determine their present distribution and use of seasonal ranges.
3. Identify high-use (key-habitat) areas and describe them according to selected physical characteristics.
4. Locate nearby suitable habitat with similar characteristics to those of the high-use areas.
5. Establish permanent ground census routes to facilitate the continuation of population monitoring.
6. Develop management guidelines for the Snake River Range goat population.

Results:

The student investigator took a job with the Idaho Fish and Game Department. His abstract should appear in the next Annual Report.

The Sociobiology of Capercaillie in
Southeast Norway

Project Leader: B. W. O'Gara
Student Investigator: P. Wegge
Cooperator: Directorate of Wildlife and Freshwater Fish,
Norway

Objective:

Study the social spacing pattern and habitat use of capercaillie cocks and hens during the breeding season.

Results:

About 120 birds were captured at five neighboring leks, radio-marked, and movements were monitored during the springs of 1980 through 1984. Lek and nest site tenacity, territoriality, and breeding performance in successive years were derived from tracking data and direct observations.

Course work is completed, and the student is analyzing and writing up final results for his dissertation to be completed in December 1985.

Grizzly/Black Bear Interactions and Competition

Project Leader: C. Jonkel
Student Investigator: H. Carriles
Cooperators: U.S. Fish and Wildlife Service; Wildlife
Management Institute; National Rifle Association;
U.S. National Park Service; Montana Department of Fish,
Wildlife and Parks; U.S. Forest Service; University of Montana;
National Hispanic Scholarship Fund

Objectives:

1. Determine black bear food habits by analysis of scats from known collared female bears and their offspring.
2. Determine habitat use preferences of collared female bears and their offspring.
3. Evaluate bear food habits in terms of plant phenology.

Results:

The student investigator is writing his thesis. The abstract should appear in the next Annual Report.

Daily Survival Rates, Movements, and Habitat Use
of Mallard Broods on Benton Lake NWR

Project Leader: I. J. Ball
Student Investigator: D. L. Orthmeyer
Cooperators: Benton Lake NWR, U.S. Fish & Wildlife
Service--Region 6

Objectives:

1. Determine daily survival rates of mallard ducklings.
2. Determine habitat preference of mallard broods.
3. Determine brood movement patterns.

Results:

During the first year of the project, the student captured and radio marked 16 adult female mallards while they were nesting. Ten hens hatched nests and 6 of those 10 fledged broods. Visual observation of broods and radio locations were mapped throughout the spring and summer of 1985.

Initial data analysis will begin this fall with another field season in 1986.

Bighorn Sheep Social Behavior and Ecology:
Trophy Hunting and Its Effects

Project Leader: D. A. Jenni
Student Investigator: C. C. Hass
Cooperators: U.S. Fish and Wildlife Service, National
Bison Range; National Rifle Association;
Camp Fire Conservation Club; North American
Foundation for Wild Sheep; Montana Department of Fish, Wildlife and Parks; Boone and
Crockett Club

Objectives:

To determine the effects of trophy hunting of bighorn sheep by:

1. Assessing "normal" behavior in one bighorn herd by collecting extensive data for a 3-5 year control period, especially on those parameters which may be most sensitive to trophy hunting, i.e., ewe reproduction and survival as it may be related to changes in lamb weights and survival, lamb birth dates, suckling time, ewe mortality, overall intersexual association patterns, and development of normal mating associations during rut.
2. Removing rams (for transplant) according to a schedule based on horn size and age.
3. Continuing data collection for an additional 1-3 year period.

Results:

C. Hass conducted field work from June 1982 through September 1984; J Hogg took over field work again in the fall of 1984. The first ram removals were completed in fall 1984. All rams 4.5 years old and older were removed. All but two moribund rams were transplanted to locations selected by the Montana Department of Fish, Wildlife and Parks.

J. Hogg completed his dissertation and the abstract appeared in last year's Annual Report.

C. Hass has been working on her thesis and expects to complete it in the fall of 1985.

Although there were quantitative differences in the distribution of breeding success of the young rams, there was no difference in the incidence of pregnancy nor in the percentage of ewes producing lambs.



CONSERVATION, EDUCATION, AND PUBLIC RELATIONS

Bart O'Gara

- 3 October 1984 Presented a 2-hour lecture on pronghorn behavior to a graduate class in mammalian reproductive behavior at University of Montana (10 graduate students).
- 17 October Met with the Vice President for Research, Dean of the Forestry School, and Director of the Border Grizzly Project to plan transfer of the project from the School of Forestry to the Unit.
- 24 October Met with a lawyer from Boone and Crockett Club to develop research plans for a ranch on the Rocky Mountain Front in Montana that the Club plans to buy.
- 29 October Gave a short presentation on golden eagle problems and research to Interior and FWS personnel at the Interior Building in Washington, D.C.
- Met with Wildlife Management Institute personnel in Washington, D.C., to review progress on the pronghorn book.
- 30-31 October-
1 November Attended Unit review at Patuxent River, MD, and Presented sessions on the Montana Cooperative Wildlife Research Unit and Information Transfer.
- 2 November Presented a short history and progress report on golden eagle/lamb problems and research in Montana to about 25 personnel from Interior and FWS, including the Director and Assistant Director, at Main Interior.
- 13 November Met with RD, Region Six, and ARF SE concerning wolf recovery plan and a public education program on wolves. Also met with ARDs and other personnel from refuges and ADC concerning research and cooperation. Met with Director and Assistant Director of DWRC concerning cooperative research and a Cooperative Education agreement.
- 15-16 November Participated in Wild Kingdom Filming in New Mexico while on leave.
- 28 November Collected a deer and demonstrated necropsy techniques to a wildlife management class of about 30 students.

29 November	Gave an informal talk on graduate school entrance requirements to about 25 students at an undergraduate student mixer.
30 November	Gave a half hour talk on wolf recovery and research in the Northern Rocky Mountains and served on a panel on endangered species at the Annual Montana Wilderness Association meeting in Butte, Montana.
3 December	Met with the Audubon Society western representative and assistant editor to discuss Northern Rocky Mountain wolf recovery article.
13 December	Gave a slide presentation on wildlife problems and needed research in the Rattlesnake Wildlife, Recreation, and Wilderness areas to a citizens' advisory committee to the Lolo National Forest.
17 December	Helped personnel of the Montana Department of Fish, Wildlife and Parks capture and transplant 39 mountain sheep.
January 1985	Spent most of January in Pakistan with Dick Mitchell from CITES and Bruce Bunting from WWF-US. The trip was successful and recommendations for three 2-3 year studies (post-doctoral through the Montana Unit) were drafted. Also, proposals for training Pakistani wildlife biologists and instigating public information programs in Pakistan were prepared.
26 January	Met with Barney Schranck to discuss the development of a committee to evaluate management strategies at C. M. Russell NWR.
February	Was asked to chair a committee to evaluate management strategies on the C. M. Russell NWR.
14 February	Presented a lecture on Asian wildlife to a University of Montana world wildlife class (25 students).
20 February	Met with BIA and USFWS personnel to discuss the need for studies on raptors and furbearers in the Flathead Valley.
4 March	Presented a lecture on parks management in Africa and Asia to University of Montana parks management class (about 35 students).

2-6 April Met with Service personnel in Washington, D.C. regarding developing programs in Pakistan. Also met with Representative Marlene and aides to Congressmen Melcher and Baucus concerning grazing on the C. M. Russell NWR.

26 April Lectured on wildlife research to grade school students at Florence Carlton Elementary School.

16 May Lectured on wildlife research to grade school students at the Superior Outdoor School.

20-25 May Spent the week on the C. M. Russell NWR evaluating range conditions and gathering information for report by the CMR DEIS working group.

14 June Met in Salmon, Idaho, with USFS, BLM, and Idaho Department of Fish and Game personnel to discuss and plan an elk study.

21 June-8 July Traveled in Pakistan to plan studies and organize a training workshop for Pakistani wildlife biologists. Met with central government officials in Islamabad, WWF-Pakistan officials in Lahore, and Provincial officials in Karachi, Peshawar, and Quetta.

4-14 August Hosted two Pakistani wildlife officials. They toured the Yaak Valley, Glacier National Park, Yellowstone National Park, Red Rock Lakes NWR, and various other wildlife study areas in western Montana.

20 August Attended a half-day meeting of the gray wolf working group recently appointed by Montana Department of Fish, Wildlife and Parks.

26 August Spend a day at the National Bison Range with a Smithsonian crew working on a pronghorn article. Provided introduction to range personnel and familiarized crew with rutting behavior of males; showed them techniques for approaching bucks for photography.

Joe Ball

3 October 1984	Met with BIA biologist to plan a study of fur-bearers on the Confederated Salish-Kootenai Tribes Reservation.
30-31 October- 1 November	Attended Unit review at Patuxent River, MD. Participated in a session on research planning.
7 November	Attended a meeting with University of Montana professors to plan Continuing Education courses.
19 December	Met with Confederated Salish-Kootenai Tribes and BPA personnel regarding Flathead Valley goose work.
15 January 1985	Met with State and University personnel regarding preparation of a monograph on grizzly bears by Charles Jonkel.
22-23 January	Made arrangements for Barney Schranck, Region 6, Refuge Supervisor for Montana and Wyoming, to meet with five candidates for an M.S. level Cooperative Education position.
19 February	Presented a lecture on the USFWS to a University of Montana careers class (60 students).
21 February	Met with Montana Department of Fish, Wildlife and Parks, BIA, and University of Montana Biological Station personnel to discuss coordination of studies in the Flathead Valley. Refereed a 10-page manuscript for Journal of Wildlife Management.
18-22 March	Conducted a 1-week Continuing Education course on Wildlife Habitat. The course was attended by 42 biologists from federal and state agencies.
3-5 April	Served as Program Chairman for NW Section meeting, The Wildlife Society.
24 May	Lectured on waterfowl management to University of Montana wildlife class.
May	Served as arbitrator in a meeting in Great Falls between USFWS, USFS, BLM, and Montana Department of Fish, Wildlife and Parks. The meeting dealt with controversies regarding oil and gas exploration relative to grizzly bears and other sensitive species on the Rocky Mountain East Front.

20 June	Attended a meeting of the Flathead Valley Canada Goose Committee.
26 June	Assisted FWS, Montana Department of Fish, Wildlife and Parks, and CSKT biologists in banding geese in the Flathead.
July	Convened a meeting of all goose research personnel in the Flathead Valley and compiled a report of current research findings relative to proposed changes in the 1985 hunting season.
19 September	Met with representatives of Montana Power Company, USFWS, and Montana Department of Fish, Wildlife and Parks at Thompson Falls to discuss development of Canada Goose nesting structures and brood pastures as mitigation practices.

Charles Jonkel

March 1985	Presented seminar on Grizzly Bear Management in Montana to the combined staffs of the World Wildlife Fund, RARE, and TRAFFIC.
	Presented seminar on Bears of North America to the combined staffs of the National Zoological Society and the Smithsonian Institution. The seminar was also open to the general public.
	Presented seminar on Bears of North America to USFWS personnel at the Patuxent Research Center.
2-5 April	Attended annual meeting, NW Section of The Wildlife Society and co-chaired session on Perspectives on Grizzly Bear Hunting in Montana.

Lee Metzgar

2-5 April 1985	Attended NW Section meeting of The Wildlife Society and served as session moderator, Toward the 1990's: Developing Programs and Concerns.
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Dan Pletscher

2-5 April 1985	Served as general session moderator at NW Section meeting, The Wildlife Society.
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Andrew Sheldon

June 1985

Attended meeting of American Society of Ichthyologists and Herpetologists, Knoxville, TN.
Gave presentation on "How rare are stream fishes: population size and species--abundance relationships."

Delivered paper on "Short-term colonization: interactions of spatial pattern and temporal sequence" to the North American Benthological Society meeting in Corvallis, OR.

Dan Pond

4-6 March 1985

Presented paper to Western States Deer Workshop, Bozeman, MT, "The use of blowguns and a modified airpistol in tranquilizing big game." Also delivered paper on "Sarcocystis in deer and elk."

2-3 April

Presented paper to the Third Western States Black Bear Workshop in Missoula, MT, titled "Neurobiology and pharmacology of sernylan, a review."

2-5 April

Attended NW Section meeting, The Wildlife Society, Missoula, MT, and delivered paper on a preliminary report on nuclear sex determination of big game animals.

Kevin Berner

26-28 March 1985

Attended Crane Symposium, Grand Island, NB.

Brent Costain

18 March 1985

Presented a talk and slide show on moose ecology and timber management to the Bitterroot Audubon Society, Hamilton, MT.

3-5 April

Attended NW Section meeting, The Wildlife Society, Missoula, MT.

12 April

Participated in Yaak Moose Project technical session, Libby, MT.

16-18 April

Attended 21st North American Moose Conference, Jackson, WY.

2-3 May

Attended the Grizzly Bear Habitat Symposium, Missoula, MT.

June-August 1985

Assisted Louisiana Pacific Corp. in the production of an educational video film on moose habitat and timber management.

Conducted informal field sessions on radio tracking and moose ecology for several groups and individuals throughout the summer.

Ana Dronkert

5-9 August 1985

Presented a paper on the status of research on the river otter in North America at The International Otter Conference, University of California, Santa Cruz.

John Grant

17 December 1984

Gave presentation to Bitterroot Chapter of the National Audubon Society, Stevensville, MT.

2-5 April 1985

Attended NW Section meeting, The Wildlife Society, Missoula, MT.

12 April

Served as judge, 1985 Montana Science Fair.

Richard Harris

December 1984

Gave seminar on age-structures as indicators of grizzly bear population status at Montana State University, Bozeman.

Presented paper on age-structure analysis at First Annual Alaska Bear Biology Conference, Anchorage, AK.

April 1985

Member of panel on simulation models and analysis of harvest data, Third Western Black Bear Workshop, Missoula, MT

April-May

Attended Montana Department of Fish, Wildlife and Parks Programmatic Grizzly Bear Management Environmental Impact Statement meetings.

Steven Knick

3-5 April 1985

Attended NW Section meeting, The Wildlife Society, Missoula, MT, and gave presentation, "Ecology of bobcats relative to human exploitation in south-eastern Idaho.

4 May 1985

Addressed the Five Valley Chapter of the Audubon Society.

Robert Leary

5-8 May 1985

Presented paper entitled, "Heterozygosity and fitness in natural populations of animals" to the Second International Conference on Conservation Biology, Ann Arbor, MI.

Randy Matchett

1984

Recipient of the Bertha Morton Scholarship, University of Montana.

November

Completed a 94-page user's manual entitled "Notes for wildlifers using the University of Montana's computing services." This manual describes use of the Dec 2065 computer and documents many data analysis and simulation programs.

3-6 March 1985

Attended the 1985 Western States Deer Workshop, Bozeman, MT.

22 March

Lectured on data management and analysis using 1022 and SPSSX for the continuing education course, Wildlife Habitat Management and Evaluation, offered by Dr. Joe Ball, University of Montana. Participants were primarily field biologists and managers.

2-3 April

Attended the Third Western Black Bear Workshop, Missoula, MT. Assisted in hands-on demonstration of computer modelling of black bear populations for participants in the Workshop.

2-5 April

Attended annual meeting, NW Section, The Wildlife Society, in Missoula, MT.

12 April

Presented summary results and management recommendations to U.S. Forest Service and Montana Department of Fish, Wildlife and Parks personnel in Libby, MT, regarding moose management in northwestern Montana.

15-18 April

Attended 21st North American Moose Conference and Workshop, Jackson, WY, and presented paper, "Moose habitat selection in the Yaak River drainage, northwestern Montana.

Pat Mullen

23 March 1985

Presented two papers to Pacific Northwest Bird and Mammal Society, Washington State University, Pullman: "Nest site competition between Canada geese and ospreys in the Bitterroot Valley, Montana" and "Reproductive ecology of ospreys in the Bitterroot Valley, Montana."

2-5 April 1985

Attended NW Section meeting, The Wildlife Society, Missoula, MT, and delivered paper, "Nest site competition between ospreys and Canada geese: implications for multi-species management."

Steve Nadeau

October 1984

Presented lecture to the University Chapter of the Wildlife Society on grizzly behavior in a park setting.

February 1985

Presented lecture to the senior class in wildlife biology on ungulate and predator comparative behavior.

2-3 April

Attended Third Western Black Bear Workshop, Missoula, MT

2-5 April

Attended NW Section meeting, The Wildlife Society, Missoula, MT.

June

Presented seminar on grizzly snaring and bear research to the Glacier National Park Bear Management Training Session.

July

Attended Border Grizzly/Wolf Technical Committee meetings in West Glacier, MT.

August

Presented seminar on grizzly behavior to Glacier National Park Bear Management Team.

Dennis Orthmeyer

January 1985

Attended Winter Waterfowl Symposium, Galveston, TX.

2-5 April

Attended NW Section meeting, The Wildlife Society, Missoula, MT.

August

Attended Mallard Symposium, Bismarck, ND.

Timm Kaminski

November 1984	Presented slide program on wolf ecology, and research findings on history, status, recovery potential, and prey relationships for wolves in central Idaho to the Idaho Outfitter's and Guides Association annual meeting, Boise, ID.
January 1985	Gave annual briefings on current status of wolves in Idaho to Congressional delegation, conservation groups, and livestock associations (ICL, Idaho Wildlife Federation, Sierra Club, Idaho Cattlemen's Assoc., Idaho Woolgrowers Assoc.).
January-October	Provided assistance to Idaho national forests and Section 7 Endangered Species Biologist in review of project EA's, forest plans, and formal and informal consultations regarding wolves in Idaho.
March	Attended Idaho Chapter, The Wildlife Society, meetings in Boise, ID. Presented a paper on the status and recovery potential for wolves in central Idaho.
April	Presented a slide program and lecture on wolf ecology and the status of wolves in central Idaho to the Payette National Forest personnel and public in McCall, ID.
2-5 April	Attended NW Section meeting, The Wildlife Society, Missoula, MT, and presented a paper on the status and recovery potential for wolves in central Idaho.
July	Participated in Northern Rocky Mountain Wolf Recovery Team meetings.
24-27 July	Attended Grizzly Bear/Gray Wolf Technical Committee meetings, West Glacier, MT.
June-September	Worked as ranger naturalist in Yellowstone National Park at wolf exhibit. Gave slide programs and demonstrations to public on wolf ecology, trapping and radio collaring, and recovery. Answered questions about wolf recovery in Northern Rockies for Secretary of Interior, NPS Director, and FWS Directorate.

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Domestic elephants proved to be the ideal all-terrain vehicle for studies in the jungles and grasslands of southern Nepal. They were used for transportation, driving deer to nets for live-capture, and radio tracking. Photo by Sanat Dhungel.

Back cover--The population of the endangered peninsular pronghorns in the Viscaine Desert now exceeds 90 animals, about double the number present 2 years ago. Increased rain during the last 2 years and predator control, instituted with the help of the DWRC, probably contributed to the improved survival of fawns. Photo by Bart O'Gara.

